SPH3U

Marking Scheme For The Test: Unit 3

Waves and Sound

Section A – Multiple Choice

1. The number of waves passing through a point per second is called as

a. wavelength b. period c. frequency d. wavelength.

1. The shortest distance between the two points on a wave in phase is

a. period b. amplitude c. frequency d. wavelength.

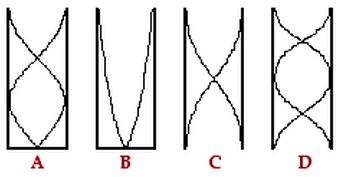
1. When a transverse mechanical wave reflects from the interface of medium of higher density,

a. the pulse returns on the same side as the incident pulse.

b. the pulse is diffracted in the new medium.

c. the pulse returns on the opposite side as the incident pulse.

d. the pulse is refracted and has a lower frequency.

1. The diagrams below represent four different standing wave patterns in air columns of the same length. Which of the columns is/are vibrating at its/their fundamental frequency? Include all that apply.

B & C

1. The diagram below represents a 'snapshot' of a wave on the surface of a pond at one instant. The wave amplitude and wavelength is given by the following combination:



Amplitude Wavelength

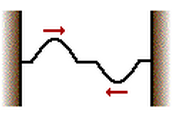
a. Q P

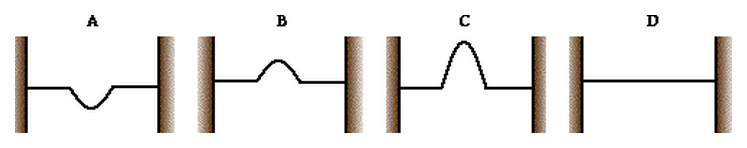
b. Q S

c. R P

d. R S

1. Two pulses are traveling in opposite directions along the same medium as shown in the diagram given below. Which diagram below best depicts the appearance of the medium when each pulse meets in the middle?





D

1. When standing waves are produced on a stretched string of length 1.2 m clamped at each end, three anti-nodes are observed. The wavelength of the standing wave is

a. 0.4 m b. 0.6 m c. 0.8 m d. 1.2 m

1. Sound is a(n) \_\_\_\_\_\_\_\_\_\_ wave.

a. electromagnetic b. longitudinal c. surface d. transverse

1. A tuning fork has a 493 Hz pitch. When a second, larger fork is struck, beat notes occur with a frequency of 16Hz. What is the frequency of the second fork?

a. 477 Hz b.485 Hz c. 501 Hz d. 509 Hz

1. When waves spread out around the edge of a barrier, \_\_\_\_\_\_\_\_\_\_ occurs.

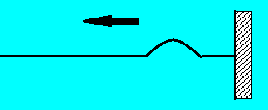
a. reflection b. refraction c. diffraction d. resonance

Section B – Short Answer Questions

*For questions 11-13, refer to diagram below in which a standing wave is established on a 4.0 m long string:*

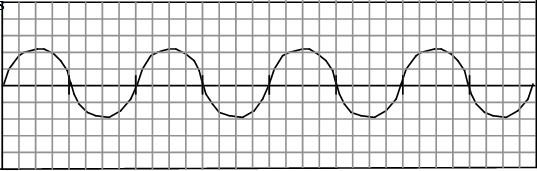
StandingWaveQuest

1. The number of nodes are : 5
2. The wavelength is: 2 m
3. If the frequency of vibration is 80 Hz, the speed of the wave in the wire is: v = fλ = 160m/s
4. The diagram shown below represents a slinky attached to a wall. A student sends a pulse down the slinky. In the space at the right of the diagram, sketch the pulse after it reflects off the wall.

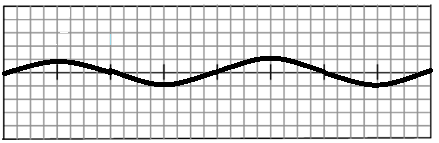


The diagram showing the pulse travelling towards left after reflection from the fixed support with a phase reversal of π.

1. The diagram below represents a transverse wave traveling through a spring. Refer to this diagram as you redraw the wave based on the changing conditions described below.



Redraw the wave with twice the wavelength and half the amplitude of the original wave.

Figure:

1. Compare the two sounds below. If they are in the same scale, which one has a higher pitch? Which one is louder? Explain why.



The first figure is of a wave with higher amplitude and loudness, whereas the second figure corresponds to the wave with higher frequency and pitch.

1. A longitudinal wave that has a frequency of 30.0 Hz travels along a coil spring. If the distance between successive compressions (condensations) is 0.400 m, what is the speed of the wave?

v = fλ = 30\*0.4 = 12 m/s.

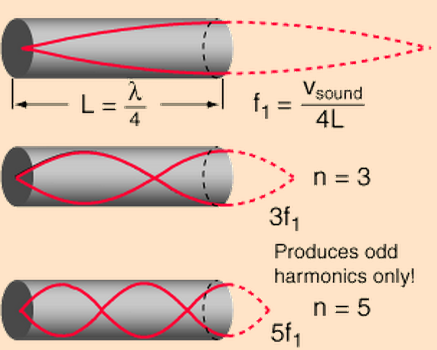
1. Your amplifier is playing a 225 Hz tone. When you double the amplitude (loudness), what happens to the speed of the sound (v) and the frequency (f)?

The change in amplitude does not change the speed or the frequency of the sound.

1. A violin string, 20.0 cm long, is emitting a G note with a frequency of 392 Hz. How long should it be to produce a C note of 523 Hz?

We know that f1L1 = f2L2, L2 = 15 cm.

1. Sketch the first three resonant lengths for a standing wave pattern in an air column open at only one end.

Figure:

Section C – Long Answer

1. For each of the following state whether they are (1) Electromagnetic or Mechanical, and (2) Transverse or Longitudinal

Water (1) Mechanical (2) Transverse

Light (1) Electromagnetic (2) Transverse

Sound (1) Mechanical (2) Longitudinal

Radio (1) Electromagnetic (2) Transverse

X-rays (1) Electromagnetic (2) Transverse

Seismic (1) Mechanical (2) Longitudinal

1. Hollow tube chimes are made of metal and are open at each end. These columns resonate best at their third resonant length. One chime is 2.5 m long and the air temperature is 25.0 oC.
2. What is the speed of sound?

v = 331.5 + 0.6\*25 = 346.5 m/s

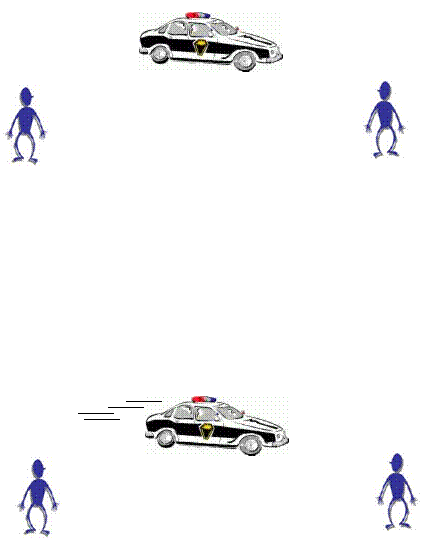
1. What is the wavelength of the sound produced?

For the third resonating length, λ = 2L/3 = 1.7 m

1. What is the frequency of the sound heard?

We know, f = v/λ = 203.8 Hz

1. Explain the Doppler’s shift with the drawings below. The first police car is stationary, but the second car is moving quickly. Draw a representation of sound waves coming from the car, and then describe the sound heard by each person.







1. As you described above, those around the moving car hear something different. Explain in terms of frequency and pitch.

The Observer from whom the car is receding away will hear the longer wavelength, lower frequency and hence of lower pitch, whereas the observer towards which the car is approaching hears a sound of shorter wavelength, higher frequency and higher pitch.

If source is receding:

If the source is approaching: